# PROFIT FUNCTION ANALYSIS OF DAIRY CATTLE FARMING IN GETASAN AND WEST UNGARAN DISTRICTS, SEMARANG REGENCY

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## ABSTRAK

Tujuan penelitian ini adalah menganalisis pengaruh faktor-faktor produksi terhadap keuntungan pada usaha sapi perah rakyat di Kabupaten Semarang. Penelitian dilaksanakan pada bulan Juli-September 2012. Metode penelitian yang digunakan adalah metode survey. Teknik pengambilan sampel dalam penelitian ini menggunakan Metode *Multistage Random Sampling*. Lokasi yang terpilih yaitu Kecamatan Getasan dan Ungaran Barat dipilih dengan sengaja karena memiliki populasi sapi perah terbanyak. Responden adalah peternak sapi perah rakyat diambil secara acak sebanyak 80 responden. Variabel yang diukur yaitu keuntungan, biaya rumput, biaya konsentrat, upah tenaga kerja, modal dan pengalaman beternak. Data dianalisis menggunakan fungsi keuntungan Unit Output Price "Cobb-Douglas". Alat uji statistik yang digunakan adalah regresi linier berganda. Penelitian menunjukkan bahwa input faktor produksi secara serempak berpengaruh nyata terhadap keuntungan peternak (P<0,05). Secara parsial biaya rumput, biaya konsentrat dan modal berpengaruh nyata terhadap keuntungan peternak (P<0,05). Rata- rata biaya produksi sebesar Rp. 1.661.827/bulan. Rata-rata penerimaan sebesar Rp. 2.399.453/bulan. Rata-rata pendapatan usaha sebesar Rp 737.425,-/bulan dengan rata-rata skala kepemilikan 2,4 ekor sapi laktasi/peternak. Hal ini menunjukkan bahwa usaha ternak sapi perah di Kabupaten Semarang menguntungkan.

*Kata kunci: Fungsi keuntungan, penerimaan, biaya, keuntungan, sapi perah*

## ABSTRACT

The purpose of this study was to analyze the influence of the production factors on the profit of the dairy cattle farming business in Semarang regency. The research was conducted during July-September 2012. The method used was a survey method. The sampling technique used multistage random sampling method. The selected locations (Getasan and West Ungaran District) were deliberately selected because they had the highest population of dairy cattle. Respondents were dairy cattle farmers who were drawn randomly as many as 80 respondents. The measured variables were profit, cost of forage, cost of concentrate, cost of labor, capital and farm experience. The data were analyzed descriptively and statistically. Data were analyzed using the profit function Output Unit Price Cobb-Douglas. Multiple linear regression was used in the study. The research showed that the factors of production inputs simultaneously significantly affected farmers profit (P<0.05). Forage cost, concentrate feed cost, and capital partially affected on farmer profit (P<0.05). The average production cost was IDR 1,661,827/year. The average profit was IDR 2,399,453/month. The average revenue was IDR 737.625/month with an average of lactation cattle scale ownership was 2.4 head/farmer. According to the result, dairy cattle's farming in Semarang Regency was profitable.

*Keywords: profit function, revenue, cost, profit, dairy cattle*

## INTRODUCTION

The livestock sector is a subsector of the agriculture sector so that the livestock sector can be used as a benchmark of economic development besides industry. Semarang Regency has a major role in the effort to develop and enhance the economy is dairy cattle farming. The existence of adequate infrastructure, a large number of population, as well as potential business

opportunities are wide open to create jobs so that they can grow the economy.

Semarang Regency could be developed because of the supporting capacity of farmer experience and potential market. Semarang Regency is strategic in terms of geography as the second largest milk producer and close to the city of Semarang. Semarang Regency which lies close to the city is a huge potential market because farmers have the opportunity to supply the consumption of milk beside milk marketing in Semarang can be done in IPS (dairy processing industry). Semarang Regency which lies close to the village will displace farmers.

Milk production in Semarang Regency increases economic and social activities. Semarang Regency is the second largest milk producer in Central Java after Boyolali Regency. The population of dairy cattle and milk production of Semarang Regency from year to year have increased. Milk production in Semarang Regency has increased from 18,199,144 liters in 2005 to 32,647,413 liters in 2010. Dairy cattle population increased from 32,546 in 2005 to 36,961 heads in 2010 (Dinas Peternakan dan Kesehatan Hewan Provinsi Jawa Tengah, 2011). Up to now cattle are reared traditionally, using simple technology, and as a side job.

The profitability of a dairy business is largely determined by milk revenues and feed costs (Hultgren et al., 2011). There is a clear positive effect on profitability of cows especially when feeding condition are optimal (Vargas et al., 2002). Strandberg (1992) reported that almost 95% of the variation in income and cost during a cow lifetime was due to these two items. Profitability can be achieved by a high milk production or by low feed costs.

The result of research conducted by Kahi et al. (2000) stated that the efficiency of production can be improved by use of breeds that are capable of increasing product yield or profitability per unit time or per unit of resources (feed, labour, capital) of a given production system. Furthermore Srairi et al. (2011) stated that milk production could be rapidly improved by balancing dietary rations that enabled the average milk yield of lactating cows to be reached, optimising feed costs and reducing the cost of milk production.

The factors of production such as cost of forage, cost of concentrate, capital and farm experience that are less or are not maximized resulting in low profit of dairy farmers. Expenditure that must be spent by a producer to obtain the factors of production and other supporting materials should be utilized so that certain products that have been planned can be realized efficiently. The purpose of this study was to analyze the factors that influence profit in dairy cattle farming business in Semarang Regency.

## MATERIALS AND METHODS

### Location and Samples

This study was conducted using a survey method. The determination of the study was used multistage random sampling method (Sotirios, 1995). The first stage was selecting districts that had the highest population of dairy cattle, that is Getasan district and West Ungaran District. In the second stage, two villages were selected which had the most dairy cattle that is Sumogawe village and Getasan village in Getasan District; and Gogik and Lerep village in the District of West Ungaran. The third stage was to obtain 80 farmers as respondents by using random sampling proportional. Sample were randomly selected from a total of 17 farmers of Getasan village, 47 farmers of Sumogawe village and 8 farmers of Gogik and Lerep village.

### Data Collection

The primary and secondary data were collected to answer the objective. The primary data were collected by questionnaire and interview. The questionnaire included the identity of respondents, physical data and cattle business finance (input and output). The secondary data were taken from The Department of Animal Husbandry and Health of Central Java province, and also from related institutions.

### Method of Analysis

The data were analyzed using descriptive analysis and linier regression. Descriptive analysis was used to describe the condition of the dairy cattle business. The relationship between profit and the factors that influence the model used Cobb-Douglas profit function. SPSS version 16 was used to do the analysis. (Soekartawi, 2002; Ghozali, 2005)

$$Y = a\, X_1^{b1} X_2^{b2} .......... X_i^{bi} ......... X_n^{bn}\, e^u \qquad ........(1)$$

To simplify assumption and obtain a good equation then the equation (1) was converted into a linear form by means of transforming the equation into the natural logarithm (ln). Farmers profit was normalized because the calculation is the value of profit divided by the price of output

(milk), thus for variable cost such as forage cost, concentrate cost, labor cost and capital were normalized by output price and expressed in IDR/year (Mandaka and Hutagaol, 2005). The model equation is

$$\ln Y = \ln A + + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + \mu \quad \text{...........................(2)}$$

Y = profit farmers normalized (IRD/year)
A = constant
$X_1$ = normalized forage cost (IDR/kg)
$X_2$ = normalized concentrate cost (IDR/kg)
$X_3$ = normalized labor cost (IDR/HKP)
$X_4$ = normalized capital (IDR)
$X_5$ = farm experience (years)

## RESULTS AND DISCUSSION

### Profile of Respondents

Most of the farmers were 27-59 years old (75.6%), in which they still in productive age. Productive age of the farmers would support the dairy cattle development. Most farmers education were graduated from elementary school (51.3%), so most farmers had low education. This condition would result in the low level of adoption of new technologies. Efforts to improve the knowledge and skills of dairy farmers could be done through non formal education that could improve business productivity. The main livelihood was largely farmers (75%). This condition was a positive asset to support the success of the dairy cattle business. The majority (41.25%) had 7-11 years of farming experience. The experience was expected to improve skills on dairy cattle business management, so it would increase the dairy cattle farmers' income. According to Eddy *et al.* (2012), experience affects the technology adoption also encourages knowledge, attitude and decision making skill of being a better farmer.

The number of cattle owned by farmers of Districts of Getasan and West Ungaran were similar (Table 1), in average 3.9 animal unit per farmer, consisting of 2.4 animal unit was lactating cows. The production of milk was relatively low. The average was 9.14 liters per head per day. The cows raised in this area were the descendant of Fries Holstein (FH). This production was lower than FH crossbred (FHC) in other regions as reported by Kuswahyuni *et al.* (2009) and Widyobroto *et al.* (2010). Priyono (2010) stated that the rate of milk production in Banyumas was 11.15 liters/head/day. The result was less than that of Priyono 2010 because levels of milk production depend on lactation month. According to Thau (2004), other factor affecting milk production were the level of education, farming experience, the existing of capital and credit, extension agents and training of farmers.

### Revenue

In this study, the revenue was obtained from the sales of milk, of calves, of culled cows and of bulls. The average of revenue (Table 2) was obtained from farmers in Semarang District about IDR 28,793,442/year or IDR 11,997,267/AU/year. Rusdiana and Praharani (2009) stated that the revenue of the dairy cattle farming business in Boyolali was IDR 15,796,750/AU/year. The revenue of farmers in Semarang District was still low due to low milk production, milk price which was relatively cheap and high production costs.

### Cost of Production

Cost of production consists of fixed and variable cost. The total fixed cost spent by farmers including dairy cattle depreciation, cage depreciation, facility depreciation and cost of electricity. Variable cost spent by farmers included forage and concentrate feed, artificial insemination, medicine and labor. The total cost spent by farmers per year was IDR 19,941,931.

Table 1. Business Profile of Dairy Cattle Farming in Semarang Regency

| Variables | District | | Average |
|---|---|---|---|
| | Getasan | West Ungaran | |
| Number of cows raised (AU) | 4.25 | 3.65 | 3.9 |
| Lactating cows (head) | 2.53 | 2.31 | 2.4 |
| Milk production (l/head) | 9.5 | 8.7 | 9.14 |
| Price of milk (IDR/liter) | 3,110 | 2,625 | 2,867 |

Table 2. The Average Revenue, Cost of Production and Profit of Dairy Cattle Farming Business in Semarang Regency

| Variables | District | | Average | Percentage |
| | Getasan | West Ungaran | | |
|---|---|---|---|---|
| | ----------------------- (IDR/year) ----------------- | | | |
| Revenue: | | | | |
| Selling of milk | 26909218 | 20,426,625 | 23,667,922 | 82.19 |
| Selling of calves | 2,750,000 | 2,875,000 | 2812500 | 9.76 |
| Selling of culled cows | - | 1,403,125 | 1,403,125 | 4.87 |
| Selling of bulls | 666,666 | 1,153,125 | 909,895 | 3.18 |
| Total Revenue | | | 28,793,442 | 100 |
| | | | | |
| Cost of Production: | | | | |
| Fix costs | | | | |
| Dairy cattle depreciation | 1,976,562 | 1,651,785 | 1,814,174 | 84.28 |
| Cage depreciation | 364,924 | 10,6875 | 235,899 | 1.09 |
| Facility depreciation | 27,315 | 24,8200 | 26,067 | 1.21 |
| Cost of electricity | 82,328 | 70,0620 | 76,195 | 13.42 |
| Total fix costs | | | 2,152,335 | 100 |
| | | | | |
| Variabel costs | | | | |
| Forage | 3,567,633 | 2,741,313 | 3,154,473 | 17.73 |
| Concentrate | 13,092,470 | 10,659,188 | 11,875,829 | 66.75 |
| Medicine | 80,796 | 26,437 | 69,925 | 0.39 |
| Artificial Insemination | 134,296 | 90,000 | 112,148 | 0.63 |
| Labor | 2,678,638 | 2,475,804 | 2,577,221 | 14.50 |
| Total of variable costs | | | 17,789,596 | 100 |
| Total of production costs | | | 19,941,931 | |
| Profit | | | 8,851,511 | |

The biggest cost was the cost of production for animal feed (concentrates and forage) which was IDR 15,030,302/year (75.36%) of the total cost of production because feed is one of the basic needs of dairy cattle except the development and growth as well as the process of milk production. The low quantity and quality of feed would affect milk production.

Sundari and Katamso (2010) reported from their research in Sleman Regency that the greatest cost was spent by feed cost that was as many as 61.28%. Furthermore Londa et al. (2013)

explained that the feed cost was the largest cost (63.84%) of the total variable costs.

**Profit**

Profit computed by subtracting revenue was obtained by cost of production. The average profitability of dairy cattle business Semarang Regency was IDR 8,851,511/Year or IDR 737,625/month on the average. The scale of ownership lactation cattle was 2.4 head/farmer. Siregar and Kusnadi (2004) stated that the Cirebon area average profit in dairy cattle was

Table 3. Factors Affecting Profit Function Analyses of Dairy Cattle Farming Bussines in Semarang Regency.

| Variables | Coefficient of Regression | Significance |
|---|---|---|
| Constant | 5.181 | 0.000 |
| Forage cost | 0.392 | 0.011* |
| Concentrate cost | 0.470 | 0.003* |
| Labor cost | -0.124 | 0.552 |
| Capital | 0.510 | 0.029* |
| Farm experience | -0.006 | 0.958 |
| F test | 19.187 | 0.000 |
| $R^2$ | 0.565 | |

*(P<0.05)

IDR 796,580/month, with an average of ownership lactation cattle was 2.42 heads/farmer.

Profits obtained by farmers in Semarang Regency were lower than those by farmer in Cirebon area. This was caused by maintenance, lactation number of cattle which was less than 60% of the total number of animals kept resulting in high production cost, and low milk production; milk price which was relatively cheap and high feed cost which was not followed by the rise of milk prices. Furthermore Prasetyo (2005) stated that the use of elephant grass basal feed was an average of 20 kg / head / day and concentrate which was around 3.5 kg/head/day on a dairy farm in Getasan district, Semarang regency, producing milk whose average was 10/liter/head/day. It provided profit per year of IDR 385,300 /head/year

**Analysis of Factors Affecting Profit in Dairy Cattle Farming Business**

The multiple linear regression model was used to analyze the factors affecting profit in dairy cattle business. The result of F test showed that the independent variables (forage cost, concentrate cost, labor cost, capital and farm experience) were found to be highly significant associated (P<0.01) with profit.

Table 3 shows the value of $R^2$= 0.565. It indicated that 56.5% of the variation in the dependent variable could be explained by the independent variable, while only 43.5% could be explained by other variables.

**a. Forage  feed cost**

The regression coefficient of the forage feed cost variable was 0.392.  If there is an increase in the forage feed cost by 10%, - followed by dairy cattle business profits of 3.92% by feeding good forage quality. Forage feed cost production factor ($X_1$) was significantly (P<0.05) influenced on the profit of dairy cattle (Y) *cateris paribus.*   Koenen *et al.* (2000) reported that the production of dairy cattle is largely dependent upon two factors: energy intake and absorbed protein. These factors are highly dependent upon forage quality as well as the interaction of the forage with the rumen microbial population, animal factors and other dietary ingredients

**b. Concentrate feed cost**

The regression coefficient of 0.470 concentrate feed cost means that if there is an increase in the concentrate cost by 10% then dairy cattle business profit will also increase of 4.7% by providing a good quality of concentrate feed. Production of concentrate feed cost factor ($X_2$) significantly (P<0.05) influenced on the profits of dairy cattle (Y) *cateris paribus.* Farmers had realized that good feed quality would enhance milk production. This is because high feeding and low concentrate feed greatly affects milk production. If the quantity of concentrate feed increases, the milk production will also increase. The farmers usually use concentrate as a source of ration to increase milk production with an average of 4.1 kg/head/day.

The result of the research conducted by Siregar (2001) in Pengalengan Kertasari and Lembang showed that the addition of higher concentrate feed with higher protein and energy content as much as 2-2.5% kg/head/day would increase the ability to produce milk as much as 2.7 to 3 L/head/day. Wanapat *et al.* (1999) stated that feeding of cassava could increase milk fat from 4.0 to 4.6% and milk protein from 3.8 to 5.3%. Otieno *et al.* (2003) stated that the increase in concentrate of 1% in dairy cattle farmer in Kenya was able to increase profits by 0.326%. Based on the research result of Jarmani and Hidayati (2005) the supplementation of 15% of fermented cassava into the concentrate in fact enhanced the milk production of 3 liters/head /day.

### c. Capital

The regression coefficient of 0.510 capitals means that if there is an increase of 10% in the capital then dairy cattle business profit will also increase by 5.1%. Production of capital $(X_3)$ significantly $(P<0.05)$ influenced on the profits of dairy cattle (Y) *cateris paribus*. Capital is an important factor in the dairy farm business because it needs large enough capital to start the business and operational activities. The significant effect between capital and profit were showed by increasing both capital equipment and supplies as well as the suitability of the cages owned that will increase the profits of the business. Usually farmers in Semarang Regency maintain dairy cows with an intensive way. In conducting their business they needed adequate equipment and supplies. The existence of equipment capital could support the optimal use of other inputs.

The benefit obtained was significantly affected by capital that the optimal use of capital and in accordance with the need will increase profit optimally. The result of the research (Monzote *et al.*, 2009) stated that low population densities in the rural areas, lack of capital and other inputs and the absence of appropriate infrastructure for smaller-scale livestock production were major constraints. In addition, Firman (2010) and Mukson *et al.* (2010) stated that the low production and productivity of the domestic milk farmer were caused by lack of capital, small cattle owned by farmer, limited feed both the quality and quantity, and the limited handling post-harvest and marketing of products.

### CONCLUSION

The average number of cattle ownership on dairy farmers in the Semarang Regency were as many as 3.9 consisting of 2.4 AU which was lactating cows. The average milk production was 9.14 liter per cattle. The production factors that significantly influenced farmers profit were forage ans concentrate feed cost and capital. The Average revenue was IDR 737.625/ month with an average of lactation cattle scale ownership was 2.2 heads/farmer.

### ACKNOWLEDGMENTS

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